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Notes on *Nacaduba normani* ELIOT in Sabah, North Borneo (Lepidoptera, Lycaenidae)

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Abstract *Nacaduba normani*, a small Lycaenid butterfly rather recently described from Borneo, belongs to the *berenice* group of the genus. The larvae of this species were found to feed on young leaves of cocoa tree, *Theobroma cacao*. The stubborn infestation by the larvae was caused by the presence of the original host plant, *Paranephelium nitidum* retained as a shade tree of the cocoa plantation. Eggs hatched 2 days after oviposition. The larval stages lasted 7 to 8 days. Very small ants were in association with the larvae. The pupal stage lasted 6 days. The emergence of adults took place between 0900 and 1000 hrs.

Key words *Nacaduba, berenice* group, cocoa, shade tree, original host plant.

Introduction

Nacaduba normani is one of the smallest *Nacaduba* species, being suggestive of *Prosotas* species in size and wing contour. It was described from Kalabakan, S. E. Sabah, Borneo in 1969. According to ELIOT (1969), it occurs with *Nacaduba berenice* in Borneo (ssp. *normani*) and Celebes (ssp. *titei*). *N. normani* is a member of the *berenice* group in the genus *Nacaduba,* and is very similar to *N. berenice*, from which it can be separated by the upperside being deeper violet blue, with the black marginal border prominently widened on the hindwing in the male, and having the black tornal spot in space 2 on the hindwing beneath more narrowly edged with paler orange in both sexes. In *N. berenice* the upperside is paler lavender blue with narrower black bordering on both wings, and the black tornal spot in space 2 on the hindwing beneath is more boldly edged with deeper orange. On the male genitalia, the two species are clearly separable by the contour of the valva. Their genitalia are illustrated on p. 131 in KAWAZOE & WAKABAYASHI (1976).

As *N. normani* was rather recently recognised and had been confused with *N. berenice* in the past, there are very few records of *N. normani* in literature. Following are data of the specimens before the authors :

1 ♂, Apas-Claremont, Tawau, 7. XI. 1974 (T. S. PAN) ; 1 ♂ 1 ♀, Lahad Datu, II. 1988 (T. S. PAN) ; 1 ♀, 10. V. 1988, otherwise same data ; 11 ♂ 1 ♀, 13. V. 1988 ; 1 ♀, 15. V. 1988 ; 6 ♂ 4 ♀, 25. V. 1988 ; 1 ♀ 26. V. 1988.

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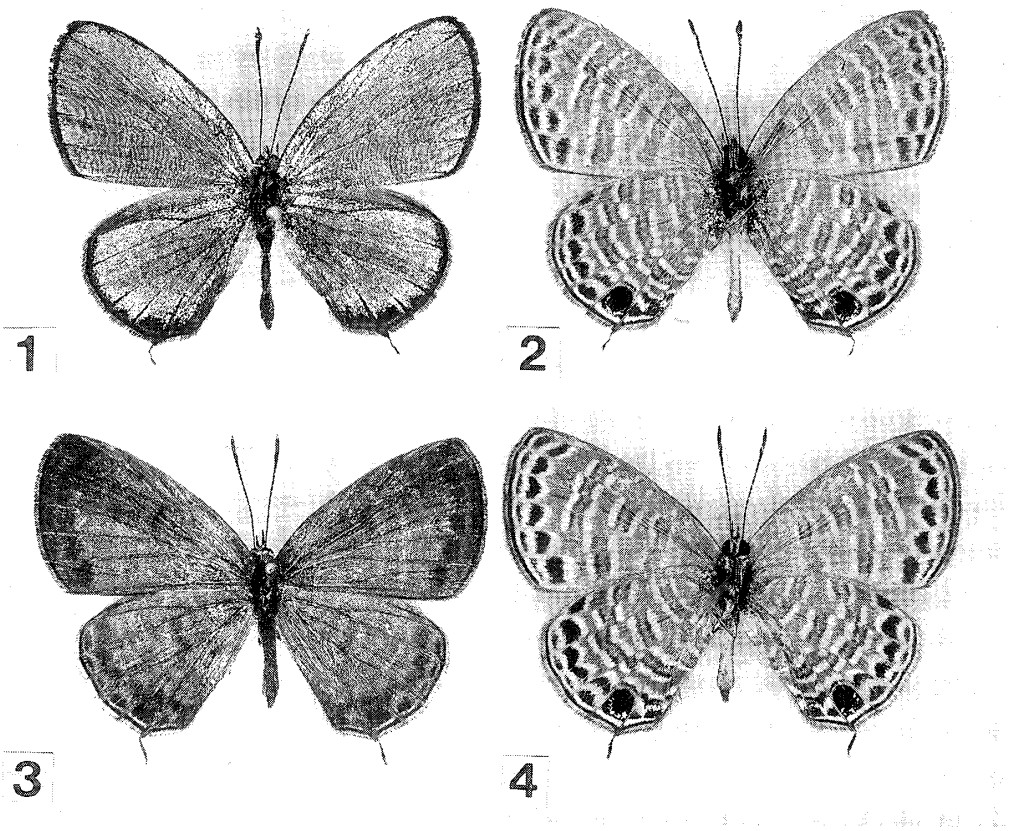

Figs. 1–4. *Nacaduba normani* ELIOT from Lahad Datu, Sabah. 1. ♂, upperside ; 2. *Ditto*, underside ; 3. ♀, upperside ; 4. *Ditto*, underside.

Field observations and a brief study of the immature stages of *N. normani* was made by the first author (PAN) from April to November, 1988 at Ladang Tanming Dua, a cocoa plantation in Lahad Datu, Sabah where he was working as assistant manager.

Food Plants and Damages

N. normani came to the attention of cocoa planters in the early 1970's, a time of the so-called "Cocoa Fever" when big acreages of cocoa plantations were being developed, when it was found to attack cocoa, *Theobroma cocoa* (Sterculiaceae). This butterfly was then observed by the author to be quite common in the Quoin Hill area, Tawau and in other cocoa-growing areas.

Although damage by the larvae of *N. normani* which fed on the young leaf flushes of the cocoa trees could be quite serious and the butterfly population could build up rapidly if left unchecked, control of this pest was quite easily effected by spraying with readily available insecticides. In most cases fortnightly rounds of spraying were sufficient to break the butterfly's life cycle and control measures were limited to spot-spraying the larvae as soon as they were noticed to prevent them from spreading.

However in some cases, especially in cocoa fields planted close to the jungle or where jungle trees had been retained to provide shade for the cocoa, infestation by the butterfly could be very persistent. Insecticide spraying here had to be repeated

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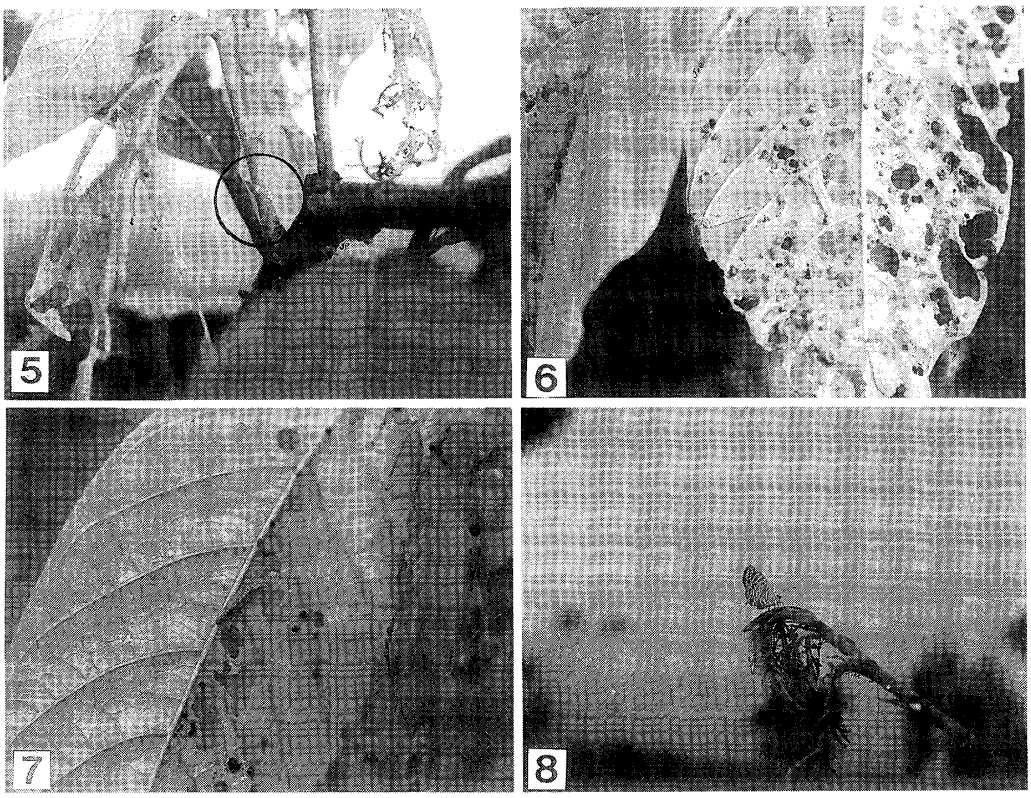

Figs. 5 – 8. *Nacaduba normani* ELIOT in a cocoa plantation. 5. A cluster of eggs on the base of a young cocoa shoot (circled) ; 6. Larvae on a young cocoa leaf, showing typical damage ; 7. Larva on a young cocoa leaf ; 8. Adult resting on a young cocoa shoot, showing damage by larvae.

regularly to prevent the young leaves from being totally damaged.

This had been the case in Ladang Tanming Dua, the site of this study. However the probable cause of this stubborn infestation was discovered by the plantation manager, Mr. Robin KIN-HUAT NG, when he found *N. normani* females ovipositing on the young leaves of a shade tree high above the cocoa canopy and beyond the range of the insecticide sprayers. This tree, one of those left of the original jungle and retained for its shade, was identified as *Paranephelium nitidum* (Sapindaceae), locally known as Membuakat. Many of this tree species remained in the plantation and inspection showed that most were hosts to *N. normani* larvae thus indicating that it was an "original" host plant of this butterfly. *Theobroma cacao,* being an introduced plant, was therefore only a recently acquired food plant and one which *N. normani* seemed now to prefer.

This author had also found *N. normani* larvae feeding on the young leaves of a climbing *Bauhinia* sp. (Leguminosae) although this did not seem to be a favoured food plant.

It would also be interseting to note here that another species of the genus, *N. berenice* had also been reported to feed on cocoa in Brumas, Tawau, Sabah, (FUJII, 1987).

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Fig. 9. One of *Paranephelium nitidum* trees in the cocoa plantation.

Oviposition and Ovum

On cocoa, as well as on *Paranephelium,* eggs were laid singly or in small clusters usually on the undersides of young unhardened leaves or on the tips of the shoots.

Fresh ova were light cream in colour, disc-shaped with rounded edges and with small depressions arranged in a spiral pattern. An ovum measured approximately 0.50 mm in diameter.

Larval Stages

Eggs hatched two days after oviposition. First and second instar larvae were light green in colour. Older instars varied from light green to light pink with darker coloured longitudinal dorsal stripes.

The complete larval stage lasted from 7 to 8 days. Unfortunately, a more detailed study of the different larval instars was not made and the duration and measurements of each instar could not be reported here.

A species of very small ant (not identified) was observed to be in close association with *N. normani* for the whole duration of the larval stage. Only this single species was found attending *N. normani* larvae in this locality and other neighbouring plantations by the author, although he was informed that another bigger species of ant had been found in association with *Nacaduba* larvae in other places.

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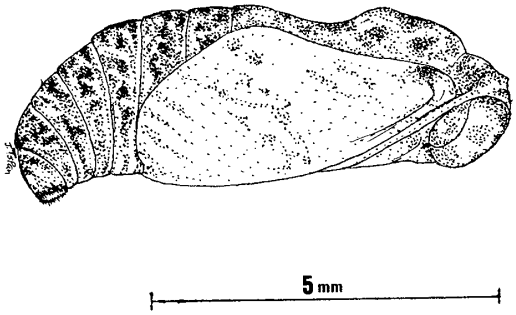

Fig. 10. *Nacaduba normani* ELIOT, lateral view of pupa.

Pupation and Pupa

In the field pupation presumably took place on the ground in the leaf litter and ground vegetation and the pupae were difficult to find. No pupae were found attached to the living leaves or other parts of the host plants.

Two colour forms of the pupa were noted. One was light green with almost no markings while the other was flesh-coloured marked with dark brown speckles, some specimens being more heavily speckled than others. Pupae measured between 7.2 mm to 7.9 mm in length and the pupal period lasted 6 days.

Emergence of Adults

Of six specimens observed, emergence took place between 0900 and 1000 hrs. Two were males and four females.

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摘　　要

北ボルネオ，サバー州産ノーマンウラナミシジミについて（潘進祥・森下和彦）

Nacaduba normani ELIOT ノーマンウラナミシジミはアマミウラナミシジミ属中最小種のひとつで，一見*Prosotas*ヒメウラナミシジミ属を思わせる．本種は1969年サバー州南東部より記載され，ELIOT (1969) によると，ボルネオの原名亜種のほかセルベスに別亜種が分布する．属内では*berenice*グループに属し，同グループの基幹種*N. berenice*によく似るが，♂翅表は*berenice*より濃い青紫色，外縁の黒色ふちどりはとくに後翅で顕著に広くなり，♂♀裏面では後翅第2室肛角部の黒紋はよりうすいオレンジ色の細条で囲まれる．*N. berenice*では，♂翅表は*normani*よりうす色，♂♀裏面後翅肛角部の黒紋は濃いオレンジ色でかなり太く囲まれる．♂ゲニタリアでは，両種はvalvaの輪郭により明瞭に区別できる．*N. normani*は*N. berenice*と混同されていたため，現在までその記録はきわめて少ない．現在森下の手許にはTawau, Lahad Datuで1974～1988年に採集された19♂9♀がある．

食樹と加害状況

本種の幼虫はココア*Theobroma cacao*（アオギリ科）を加害する．著者は1970年代に本種がタワウ市のココア園に多産することを知った．幼虫はココアの木の若芽を食し，防除を怠たると蝶の個体数は急速に増えるが，殺虫剤の噴霧により容易に駆除できた．ふつう2週間毎の噴霧で充分であった．しかしLahad DatuのLadang Tanming Duaのココア園のように熱帯雨林に近接する場合，加害はしつようで，噴霧の回数を多くしなければ若葉は完全に食害される．たまたま噴霧のとどかないココア園の緑陰樹*Paranephelium nitidum*（ムクロジ科）に産卵する本種♀を発見したとき，こうしたしつような加害の原因を推定し得た．この樹はもともと同地方の熱帯雨林を形成する樹種のひとつで，ココア園に適当な日影を与えるためとくに残されたものであった．その後の調査ではこの樹種の大多数が本種の食樹であることが明らかになった．*N. normani*の本来の食樹はこの*P. nitidum*であり，輸入樹であるココアは当然二次的な食樹である．ただし現在では本種はココアの方を嗜好するらしい．さらにマメ科の蔓草*Bauhinia*羊蹄甲藤の1種の若葉を食べる本種の幼虫を観察したが，この植物は好まれないようである．なお本種の近縁種*N. berenice*も同じサバー州Tawauでココアにつくことがが FUJII（1987）により詳細に報告されている．

産卵・幼生期・羽化

ココア，あるいは*Paranephelium*でも，卵は軟らかい若葉の裏面または若枝にひとつずつ，または数個まとめて生みつけられる．産卵直後はクリーム色，2日後にふ化．形は通常のまんじゅう型，多数の凹点がらせん状に刻まれ，直径約0.5 mm．1，2令幼虫はうすみどり色，中令以降はうすみどりからうすいピンク，濃色の背線，亜背線が認められる．幼虫期間は7～8日．未同定の小型のアリの1種が訪れるが，本種と関係をもつのはこの1種に限られる．野外では地上の落葉，カバープラントの間で蛹化するらしく，食樹上で蛹を見出したことはない．蛹の色彩に2型あり，ひとつはうすみどりでほとんど無紋，他は肉色，黒褐色の斑点があり，斑点の大小は個体により一定しない．蛹は長さ7.2 mm－7.9 mm，蛹期間は6日．成虫の羽化は午前9時から午前10時までに行われた．

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